Mine file
D.W. Hebberg

Kennecott
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Gregory H. Boyce
Director, Environmental Affairs

July 1, 1986

Kennecott

Mr. Lowell P. Braxton
Administrator
Mineral Resource Development
and Reclamation Program
Division of Oil, Gas and Mining
Utah Department of Natural Resources
365 West Temple
Three Triad Center, Suite 350
Salt Lake City, Utah 84150

SUBJECT: Utah Copper Division Modernization Project

Dear Mr. Braxton:

Enclosed for incorporation into the "Phase II" package of Kennecott's Mining and Reclamation Plan Amendment is the information requested in your tentative approval letter of June 27, 1986.

- o A complete copy of the correspondence between the Utah Department of Health and Kennecott will be provided after a permit is issued by the Bureau of Water Pollution Control. This package will address:
  - Plans for the containment and recovery of potential leaks from the twin 48-inch pipeline.
  - Details regarding the groundwater monitoring program for the area downgradient of the proposed grinding plant site and pipelines.
- o Kennecott formally requests a variance to Rule M-10(7) for the ore slurry pipeline, the return water pipeline, the service road paralleling the pipelines, the service road in the ore conveyor corridor and the plant access road. The pipelines will be used after permanent mine closure to divert mine runoff away from the populated areas downgradient from the mine. The service road parallel to the pipeline will continue to be used as a maintenance road. The ore conveyor corridor service road and the plant access road will be used to access the southern terminus of the pipelines. The corridors containing the service roads and the plant access road are delineated on the enclosed Exhibit A, "Disturbed Area Location." Kennecott will continue to be responsible for maintenance of these facilities unless other arrangements are completed.

Wayne:
Let's discuss this
LDB 7-8

0003

- A revision of drawing 712-SKC-3-152 (Exhibit A, "Disturbed Area Location") delineating the entire permit and disturbed area boundaries is enclosed.

- Specification 17594-GC-005, "Grading of Flotation Feed Pipeline Corridor" (Bechtel) and specification SPC-10-CE-6300-602, Earthwork For Ore Conveyor Corridor (Parsons) are enclosed.

- Because the ore conveyor corridor, pipeline corridor and plant access road corridor will remain intact after permanent mine closure, the permanent seed mixture will be utilized during post-construction planting of these areas. The post-construction seed mixture will be utilized on the grinding plant site.

- A more detailed reclamation cost breakdown for reclamation is given in the attached Tables 1 through 10.

Please advise us of the final bonding amount so that bond arrangements may be completed in a timely manner. If additional clarification is required, please contact Al Trbovich (322-8263).

G. H. Boyce

AMT/GHB/mf
Attachments

cc: V. R. Rao, w/attach.
S. D. Taylor, w/attach.
A. M. Trbovich, w/attach.

TABLE 1

EARTHWORK DETAIL

DEMOLITION AND DISMANTLING ESTIMATE FOR BOND ESTIMATE

Item	Quantity
Fill and Compact Coarse Ore Stockpile Cavity	50,000 cy
Fill and Compact Grinding Building Cavity	35,000 cy
Fill and Compact Slab on Grade	10,000 cy
TOTAL	95,000 cy

TABLE 2

CONCRETE DEMOLITION DETAIL

DEMOLITION AND DISMANTLING ESTIMATE FOR BOND ESTIMATE

Item	Quantity	Manhours
Structural Concrete		
Coarse Ore Storage	100 cy	
Grinding Plant	200 cy	
Tanks and Miscellaneous	100 cy	
Subtotal	400 cy	3,200
Equipment Foundation Concrete		
SAG Mills	650 cy	
Ball Mills	1,500 cy	
Miscellaneous Equipment	200 cy	
Subtotal	2,350 cy	4,700
Elevated Concrete	1,560 cy	6,240
TOTAL	4,310 cy	14,140

TABLE 3

STEEL DEMOLITION DETAIL

DEMOLITION AND DISMANTLING ESTIMATE FOR BOND ESTIMATE

Item	Quantity	Manhours
Grinding Building Structural Steel	3,470 st	12,145
Coarse Ore Stockpile Structural Steel	1,402 st	3,080
Miscellaneous Structural Steel	310 st	1,550
Secondary Steel	792 st	3,960
Miscellaneous Iron	199 st	1,000
Bridge Steel, Bents and Trusses	902 st	4,510
TOTAL	7,075 st	26,245

TABLE 4

BUILDING FINISH DEMOLITION

DEMOLITION AND DISMANTLING ESTIMATE FOR BOND ESTIMATE

Item	Quantity	Manhours
Grinding Building Siding	161,000 sf	3,220
Grinding Building Roofing	201,000 sf	6,030
Pre-Engineered Buildings		
Building 1	375 sf	-
Building 2	7,200 sf	-
Building 3	432 sf	-
Building 4	800 sf	-
Building 5	7,200 sf	-
Subtotal	16,007 sf	4,000
Truck Scale Pit	750 sf	500
TOTAL	387,757 sf	13,750

TABLE 5

MECHANICAL BULKS DEMOLITION (TANKS)

DEMOLITION AND DISMANTLING ESTIMATE FOR BOND ESTIMATE

Item	Quantity	Manhours
Ductwork, Chutes and Liners	789 st	8,000
Bins and Hoppers	118 st	1,000
Small Steel Tanks	62 st	500
Other Tanks	198 st	1,100
TOTAL	1,167 st	10,600

TABLE 6

PLANT EQUIPMENT DEMOLITION

DEMOLITION AND DISMANTLING ESTIMATE FOR BOND ESTIMATE

Item	Quantity	Manhours
SAG Mills (3 each)	3,000 st	15,000
Ball Mills (6 each)	3,270 st	16,350
Belt Conveyors	510 st	4,700
Other Equipment	2,600 st	12,000
TOTAL	9,380 st	48,050

TABLE 7

PIPING DEMOLITION

DEMOLITION AND DISMANTLING ESTIMATE FOR BOND ESTIMATE

Item	Quantity	Manhours
Grinding Building	87,000 lf (435 st)	21,750
Coarse Ore Stockpile	2,000 lf (6 st)	250
Lime Plant	9,890 lf (35 st)	1,400
TOTAL	476 st	23,400

TABLE 8

ELECTRICAL EQUIPMENT DEMOLITION

DEMOLITION AND DISMANTLING ESTIMATE FOR BOND ESTIMATE

Item	Quantity	Manhours
Switchgear	61 each	1,500
Transformers	43 each	1,500
Capacitors	70 each	1,500
Light Fixtures	1,493 each	800
Bus Bar	960 lf	500
Miscellaneous Equipment	1 Lot	750
TOTAL	--	6,550

TABLE 9

CABLE TRAYS AND CONDUIT DEMOLITION

DEMOLITION AND DISMANTLING ESTIMATE FOR BOND ESTIMATE

Item	Quantity	Manhours
Cable Trays	32,720 lf	6,600
Conduit	118,674 lf	11,400
TOTAL	151,394 lf	18,000

TABLE 10

WIRING AND CABLE DEMOLITION

DEMOLITION AND DISMANTLING ESTIMATE FOR BOND ESTIMATE

Item	Quantity	Manhours
Wire and Cable on Trays	300,000 lf	3,000
Five KV Line	48,130 lf	2,000
TOTAL	348,130 lf	5,000

FILE COPY

BECHTEL CIVIL & MINERALS, INC.

GENERAL SPECIFICATION

17594-GC-005

FOR

GRADING OF FLOTATION FEED PIPELINE CORRIDOR

FOR

UCD MODERNIZATION PROJECT - GRINDING PLANT

KENNECOTT

SALT LAKE CITY, UTAH

JOB NO. 17594

Rev. No.	Date	Revisions	Supv. Eng.	Chief Eng.	Proj. Eng.	Client
0	3/31/86	Issued for Construction				
A	3/11/86	Issued for Client Approval				
			APPROVALS			

GENERAL SPECIFICATION

FOR

GRADING OF FLOTATION FEED PIPELINE CORRIDOR

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GENERAL SPECIFICATION

FOR

GRADING OF FLOTATION FEED PIPELINE CORRIDOR

1.0 GENERAL

1.1 These technical specifications establish the quality of materials and workmanship and define how quality is measured for the grading of the Flotation Feed Pipeline Corridor.

1.2 Pipeline Corridor design is based on balanced cut and fill quantities. However, due to variations in contours, shrink/swell factors and construction methods, design drawings delineate areas where cut and fill adjustments can be made. Contractor is responsible for evaluating the extent such factors affect the work and for taking such action as is required, at no extra cost to Owner.

2.0 ABBREVIATIONS

The abbreviation below shall mean:

ASTM American Society for Testing and Materials

3.0 CODES AND STANDARDS

Unless otherwise specified or shown, the following codes and standards shall apply to the extent indicated by references herein.

ASTM D 422-63	Method for Particle-Size Analysis of Soils (r72)
ASTM D 1556-82	Test Method for Density of Soil in Place by the Sand-Cone Method (r83)
ASTM D 1557-78	Test Method for Moisture-Density Relations of Soils and Soil - Aggregate Mixtures using 10 lb Rammer and 18 inch Drop

ASTM D 2922-81	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318-84	Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils
17594-GC-029	Bechtel Specifications for Supply and Installation of Culverts and Miscellaneous Drainage Items

4.0 SURVEY

4.1 The Contractor will establish the control lines based on benchmarks and monuments shown and shall be responsible for all surveying to control the work.

4.2 All survey work will be subject to checking by the Manager.

5.0 CLEARING, GRUBBING AND STRIPPING

5.1 Clearing, grubbing and stripping shall be performed as required and as directed.

5.2 Clearing will consist of the removal and disposal of all trees, brush, logs, limb wood, grass, rubbish, structures and all other obstructions resting on the surface of the original ground. Also included is the removal of brush and grass root material which compose approximately the top 0.3 feet of surface material. Unless otherwise shown, clearing shall be performed within the limits of and 5 feet outside the limits of the excavation and fills.

5.3 Grubbing will consist of the removal and disposal of all stumps, buried logs, stubs and roots larger than 1 1/2 inch in diameter within the areas cleared to a depth of 1.5 feet below original ground. Within areas to be filled, stump holes and depressions shall be backfilled and compacted. Within areas to be excavated, stump holes may be left open.

5.4 Cleared and grubbed matter shall be disposed at areas as approved or directed by the Manager and shall meet the requirements of all Federal, State and Local agencies having jurisdiction. Burning on site will not be allowed.

5.5 Stripping will consist of the removal of organic surface soil with organic contents greater than 5% as directed. This material shall be stockpiled at areas shown or as directed by the Manager. Stockpiled topsoil shall be fertile, friable, loamy and free of subsoil, refuse, roots, heavy or stiff clay, stones larger than 1 inch, weeds, litter and other deleterious materials. The surface soils are not organic and generally do not require removal.

5.6 All work shall avoid, as far as practicable, injury to ground surfaces and trees growing in areas outside the slope limits of excavations and embankments. All buildings outside slope limits shall be preserved unless otherwise directed.

6.0 OVEREXCAVATION

6.1 In areas to be filled or within two feet of the top of finished elevation where soft surface material (standard penetration resistance less than 5) is encountered, it shall be removed and replaced with compacted fill as directed.

7.0 EXCAVATION

7.1 All excavation shall be performed within the lines, grades, sections and elevations shown. Excavation beyond the specified tolerance to suit construction methods may be performed at the Contractor's expense and with the Manager's approval.

7.2 All excavation performed in the pipeline corridor shall be considered unclassified excavation regardless of the nature of the materials excavated. No additional allowance above the Contract price will be made for excavation of material requiring heavy ripping or blasting. For the purpose of material description to define allowable grading tolerances per Subsection 7.3 herein, rock shall be considered to be material that cannot effectively loosened or broken down by ripping in a single pass with a tractor-mounted single shank ripper of standard manufacturer's design adequately sized for use with and propelled by a crawler-type tractor rated between 385 and 410 net flywheel horsepower, operating in low gear. Testing to determine compliance with this specification shall be made upon request of the Manager.

7.3 Except as otherwise shown, grading tolerances shall be from plus 0.3 feet to minus 0.2 feet for horizontal and sloped planes of excavation except for rock where tolerances shall be zero to minus 0.5 feet for horizontal and sloped planes of excavation.

7.4 In all excavation requiring blasting, Contractor shall take every precaution to prevent overshooting. Blasting may be by any method which will prevent overbreaking below elevations indicated on plans. Blasting method shall be submitted to Manager for review. Material outside the authorized cross section which has been shattered or loosened by blasting shall be removed.

7.5 Overexcavated horizontal areas shall be restored to the designated grade with compacted fill.

7.6 The method of excavation shall not weaken surrounding areas or damage structures or parts thereof that are completed or under construction. Existing structures and utilities adjacent to excavations shall be protected and supported to prevent settlement. Survey benchmarks and monuments shall be protected by barriers or flagged markers.

7.7 In accordance with the factors mentioned in Subsection 1.2, excess excavated material shall be placed on the embankment downslope as shown.

7.8 Areas being excavated and/or filled shall be maintained in a clean condition, free from leaves, brush, sticks, trash and other debris.

8.0 FILL MATERIALS

8.1 Excavated materials free from deleterious substances such as expansive clay, snow, ice, frozen ground, rubbish, organic, perishable or noncompactable material shall be utilized for fill.

8.2 In accordance with the factors mentioned in Subsection 1.2, when fill material is not available from excavation in sufficient quantity, it shall be obtained by widening cuts as shown.

8.3 Materials from rock excavation shall only be used for embankment fill in areas 5 feet below the top of grade except where corridor includes process water pipeline, these materials shall be placed 8 feet below the grade shown on design drawings. The fill material shall be well graded and contain no rock larger than 2.5 feet in the least dimension, except on the slope faces where larger sizes maybe placed.

8.4 Trench fill and bedding for culverts shall conform to the requirements of Specification 17594-GC-029.

9.0 PLACING AND COMPACTING FILLS

9.1 The upper 0.5 feet of existing ground surfaces to receive fill, with the exception of undisturbed rock or very strongly cemented soil, shall be scarified, moisture conditioned as noted below and recompacted to 90 percent of maximum dry density as determined by ASTM D 1557.

9.2 Existing ground surfaces and embankments steeper than one vertical on four horizontal, which are to receive compacted fill, shall be continuously benched. Benches shall be sufficiently wide to permit operations of placing and compacting equipment. Soils which do not permit slope benching shall be compacted as each layer is placed.

9.3 Stump holes, depressions and other cavities shall be filled to the natural surface of the ground prior to placing fill material.

9.4 Mechanical compaction equipment shall be used in all fill operations.

9.5 Each layer of fill shall be kept approximately parallel to the final grade.

9.6 Where predominantly fine grained soils are utilized in embankments, the fill shall not contain any particle exceeding 3/4 of the lift thickness and shall be compacted in maximum lifts of 0.7 feet after compaction, to a minimum of 90 percent of maximum dry density as determined by ASTM D 1557. Moisture content during compaction shall be maintained within 2 percent below to 3 percent above optimum moisture content for material being placed, as well as top or contact surfaces of previous fill or exposed grade. Wetting and drying operations shall be performed in a manner that assures uniform moisture content throughout each lift.

9.7 Rock-fill shall be compacted as specified below:

9.7.1 Required compaction shall consist of a minimum four passes with a vibratory-type tractor pulled roller having a minimum weight of 10 tons. At least 90 percent of the weight shall be transmitted to the ground through a single steel wheel. The drum shall have a diameter between 60 and 66 inches and a width between 72 and 80 inches; and the weight of the vibrating portion (including the drum, shaft and internal machinery) may not be less than 12,000 pounds. The frequency of vibration during operation shall be between 1,100 and 1,500 cycles per minute, and the dynamic force at the operating frequency shall not be less than 40,000 pounds. The roller shall be operated at speeds not to exceed 2.5 miles per hour.

9.7.2 Compacted thickness of each lift shall be no more than 3.0 feet. In lieu of the roller-type and number of passes specified above, alternative compaction equipment and procedures which will impose equivalent compactive effort, approved by the Owner's soil engineer, may be employed.

9.7.3 All rock-fill shall be thoroughly and uniformly wetted prior to compaction so that, during compaction, the moisture content of the fraction of rock-fill passing the 3/4-inch screen will be maintained at or above the optimum moisture content as determined by ASTM D 1557.

9.8 Compaction requirements trench fill and bedding for culverts shall be in accordance with Specification 17594-GC-029.

9.9 During freezing weather care shall be exercised to ensure that fill contains no frozen material and that fill is not placed on frozen ground. Thick layers of frost shall be removed and thin layers broken up with a sheepsfoot compactor. When the temperature falls below 35°F, it shall be the responsibility of the Contractor to protect all areas of completed surface against any detrimental effects using approved methods. Any areas that are damaged by freezing shall be removed or reconditioned, reshaped and recompacted by the Contractor in conformance with the requirements of this specification.

10.0 TESTING

10.1 Tests for specified compaction will be made by others in accordance with the following:

10.1.1 Maximum density and optimum moisture content shall be determined in accordance with ASTM D 1557, Method D.

10.1.2 In-place density shall be determined in accordance with ASTM D 1556 or D 2922. When ASTM D 2922 is used, the nuclear densometer shall be calibrated by comparison with results from ASTM D 1556. Initially, three (3) check tests of density and moisture shall be performed by the sand cone method. Thereafter, one (1) test in ten (10) shall be verified with a sand cone test. At least one check shall be performed each day for each material. Nuclear densometers shall not be used under freezing conditions.

10.2 Tests for maximum density will be made for each type of material encountered or one test for each three sand cone tests with a minimum of one test for every five working days.

10.3 Field in place density tests will be made as required to verify that the specified compaction is achieved. A minimum of one test per shift will be made in each different type of material being placed.

10.4 Where compaction of existing ground or fill material does not meet the specified compaction, it shall be reworked until it complies with the specified in-place density.

11.0 DRAINAGE AND WATER CONTROL

11.1 Pipes for culverts shall be as shown on drawings. Material and installation requirements for culverts shall be in accordance with the requirements of Specification 17594-GC-029.

11.2 Contractor shall take measures to control soil erosion from the construction areas during the life of the Contract. Such measures shall include berms, dikes, dams, sediment basins, fiber mats, netting, gravel, mulches, grasses, slope drains and other erosion control devices or methods.

11.3 Water in excavations shall be controlled and removed. Discharge from pumps shall be wasted at locations as directed. Springs or seepage encountered shall be reported immediately and controlled as directed.

11.4 Rip-rap shall be placed as shown. Rip-rap material and placement shall be in accordance with the requirements of Specification 17594-GC-029.

11.5 Contractor shall maintain in a clean and sound condition all culverts, ditches and temporary drainage features during the life of the contract.

12.0 ROAD MAINTENANCE AND DUST CONTROL

12.1 Contractor shall ensure that roads crossing and to the Pipeline Corridor are kept passable and shall be responsible for repairing damage to these roads caused by his operations. Repair materials and workmanship shall conform to the existing construction.

12.2 Contractor shall perform all work in such a manner as to minimize fugitive dust emissions, including but not necessarily limited to application of water to roads. Failure to control fugitive dust emissions could result in a stop work order from the State of Utah or Salt Lake County until adequate controls are instituted. Such work stoppage shall not relieve the Contractor of his contractual responsibilities nor be cause for claims against Owner.

13.0 CONTRACTORS QUALITY CONTROL

13.1 Within 20 calendar days of Contract award Contractor shall submit for approval his quality control program. The program shall include the following data.

13.1.1 Surveying - Specify equipment to be used and general procedures to be followed.

13.1.2 Compaction - Contractor shall submit an acceptable plan to achieve fill compaction as specified herein. The plan shall include proposed equipment and procedures for rolling and moisture conditioning.

13.2 Contractor shall designate his representative with direct responsibility for quality control.

14.0 INSPECTION AND EVALUATION OF WORK

14.1 The work will be inspected in progress as well as at completion of various operations by the Manager as follows:

14.1.1 To inspect and approve foundation surface prior to placement of fill.

14.1.2 To arrange for in-place density and moisture content tests on compacted fill to verify conformance to this specification and any other field or laboratory testing as may be required.

ISSUED FOR

- [ ] IN-HOUSE REVIEW
- [ ] CLIENT APPROVAL
- [ ] QUOTATION
- [ ] PURCHASE
- [X] CONSTRUCTION
- [ ] _____

SPECIFICATION TITLE SHEET

THIS SHEET IS A RECORD OF EACH ISSUE OR REVISION TO THE SUBJECT SPECIFICATION. EACH TIME THE SPECIFICATION IS CHANGED ONLY THE NEW OR REVISED SHEETS NEED TO BE ISSUED.

THE EXACT SHEETS CHANGED AND THE NATURE OF THE CHANGE SHOULD BE NOTED UNDER REMARKS. THESE REMARKS ARE NOT A PART OF THE SPECIFICATION. THE REVISED SHEETS BECOME PART OF THE ORIGINAL SPECIFICATION AND SHALL BE COMPLIED WITH IN THEIR ENTIRETY.

- [X] ENTIRE SPECIFICATION ATTACHED
- [ ] REVISED SHEETS ONLY ATTACHED

MMD/6424

REV.	DATE	BY	CK	APPROVALS					REMARKS
				SECTION	PROJECT		CLIENT		
A	3/25/86	GH	CCW	J.C.					ISSUED FOR CLIENT APPROVAL
0	4/28/86	GH	CCW	J.C.					ISSUED FOR CONSTRUCTION
1	5/22/86	GH		J.C.					REVISED PARA. 3.12

FILE COPY

PROJECT. CLIENT. LOCATION

KENNECOTT
UCD - MINE MODERNIZATION PROJECT
SALT LAKE CITY, UTAH

SPECIFICATION TITLE

EARTHWORK

PARSONS SPECIFICATION	SHEET	OF	JOB NUMBER	SPECIFICATION NUMBER	REV.
	1	9	6424-01	SPC-10-CE-6300-602	1

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1.0 GENERAL

1.1 Scope

The Contractor shall provide all labor, equipment, and materials required for fill, excavation, roadbed and subgrade preparation, earthwork required for foundations, construction of the roadway, and other items for work, indicated and specified. All work shall conform to the lines, grades and cross sections as indicated, on the drawings.

As hereinafter used, the term Owner shall be understood to mean the Owner, his designated representative, or Manager.

1.2 General Requirements

A A qualified geotechnical engineer shall act as the Owner's representative and shall make observations of site grading operations and tests as considered necessary for quality control.

B The Contractor shall furnish all stakes, markers, tools and equipment required to layout the work. Control point markers that are disturbed by the Contractor's operations shall be replaced at his expense by a Registered Licensed Land Surveyor.

C Excavation, embankment and backfill work areas shall be continually and effectively drained. Water shall not permitted to accumulate in excavations or foundation areas. The Contractor shall construct suitable dikes, drains or provide pumping equipment, as required, to divert water flows away from the work areas.

D Equipment and tools used in the work shall be maintained in operable condition during the entire period of construction.

E Dust resulting from construction operations shall be controlled to prevent dust spread and to avoid creation of a nuisance in the surrounding area.

F The Contractor shall protect adjacent property and avoid damage to such property. Adjacent property damaged due to the Contractor's operations shall be repaired or replaced at his own expense. Repairs or replacements shall be at least equal to existing improvements and shall match existing finish and dimension.

G Compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557, Method D. During compaction optimum moisture content shall be maintained, plus or minus 2 percent.

H Blasting will be permitted only with the Owner's approval. Blasting shall conform to all State, County, and Local laws and

regulations, and to the United States Department of Labor, Occupational Safety and Health Administration, Safety and Health Regulations for Construction. Where explosives are used in rock excavation, the charges shall be so proportioned and placed so that they will not loosen the rock outside of the excavation lines shown on the plans. Any material outside the authorized cross section which may be shattered or loosened because of blasting shall be removed by the Contractor at his expense.

I Clearing and grubbing shall conform to the requirements specified in the specification SPC-10-CE-6300-601.

1.3 Codes and Standards

Work included in this specification shall conform to the latest issue of the applicable requirements of the following codes, standards, and reports:

A State of Utah Standard Specifications for Road and Bridge Construction.

B American Society for Testing and Materials (ASTM)

1. D-1557 - Tests for Moisture-Density Relations of Soils, Using 10 Lb Rammer and 18 In. Drop.

2. D-1556 - Standard Test Method for Density of soil in place by the sand-cone method.

3. D-422 - Method for Particle-Size Analysis of soils.

4. C-131 - Test Method for Resistance to Degradation of small-size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

5. D-4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of soils.

2.0 MATERIALS

A General Fill

Satisfactory materials shall be clean friable earth, sand, gravel, crushed rock or clays of low plasticity, free of organic material, cinders, trash, rubble and stones greater than 6 in. in any dimension.

B Free Draining Backfill

Free draining backfill shall meet the following grading requirements as determined by ASTM D422.

Sieve Size (Square Openings)	Percent Passing by Weight
3 inch	100
No. 200	0-5

The plasticity index shall be nonplastic when tested by ASTM D4318. Coarse aggregate shall have a percent of wear, when subjected to the Los Angeles abrasion test (ASTM C131), of no greater than 40.

3.0 CONSTRUCTION

3.1 Weather

Unless approved, fill shall not be placed when the atmospheric temperature is below 32 degrees or at 35 degrees F and falling. When the temperature falls below 35 degrees F, it shall be the responsibility of the Contractor to protect all areas of completed surface against any detrimental effects using approved methods. Any areas that are damaged by freezing shall be removed or reconditioned, reshaped and recompacted by the Contractor in conformance with the requirements of this specification.

Fill shall not be placed on snow, ice or frozen ground surfaces.

3.2 Excavation

Excavation will be unclassified regardless of the nature of material encountered. The contractor shall excavate every type of material encountered within the limits of the work, to the lines, grades, and elevations indicated and as specified herein. Grading shall be in conformity with the typical sections shown and the tolerances specified in paragraph 3.10, Finishing. Satisfactory excavated materials shall be transported to and placed in fill or embankment areas within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials as directed. Such excavated material and the satisfactory material ordered as replacement shall be included in excavation.

A Excavation of ditches, gutters, and channels shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. Care shall be taken not to excavate ditches and gutters below grades shown. Excessive open ditch or gutter excavation shall be backfilled with suitable materials to grades shown. Materials excavated shall be disposed of as shown or as directed, except no material shall be deposited less than 3 feet from the edge of a ditch. The Contractor shall maintain all excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

B Excavation for structures shall be made accurately to the lines, grades, and elevations shown or as directed. Trenches and

foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as required. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm surface, either level, stepped, or serated, as shown or as directed. Loose disintegrated rock and thin strata shall be removed. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the new grade level shall not be made until just before the concrete is to be placed. If the excavation is open for 48 hours or more, a 3" concrete "seal" slab must be placed on the bottom of the excavation.

C Protection or removal of utility lines: Existing utility lines that are shown on the plans or the locations of which are made known to the Contractor prior to excavation and that are to be retained, as well as utility lines constructed during excavation operations, shall be protected from damage during excavation and backfilling and, if damaged, shall be repaired by the Contractor. In the event that the Contractor damages existing utility lines that are not shown on the plans or the locations of which have not been known to the Contractor report of such damage shall be made immediately to the Owner. If the Owner determines that repairs shall be made by the Contractor, such repairs will be directed and an equitable adjustment will be made to the contract price. When utility lines that are to be removed are encountered within the area of operations, the Contactor shall notify the Owner in ample time for the necessary measures to be taken to prevent interruption of the services.

3.3 Utilization of Excavated Materials

All unsatisfactory materials removed shall become the property of the Contractor and be disposed of outside the limits of the work lines. Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of embankments, subgrades, bedding, as backfill, and for similar purposes. No satisfactory excavated material shall be wasted without specific written authorization. Satisfactory material authorized to be wasted shall become the property of the Contractor and be disposed of outside the limits of the work lines. No excavated material shall be disposed of in such a manner as to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

3.4 Selection of Borrow Material

Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained by the Contractor from private sources approved by the Owner. Unless otherwise provided in the contract, the Contractor shall obtain from the borrow pit owner

the right to procure material, pay all royalties and other charges involved, and bear all expense of developing the sources, including the right-of-way for hauling.

3.5 Backfill

Free draining backfill (Section 2.0B) shall be used behind retaining walls and for the reinforced volume of reinforced earth. Backfill adjacent to any and all types of structures shall be placed and compacted to at least 90% of maximum density for cohesive materials or 95 percent of maximum density for cohesionless materials, in such a manner as to prevent wedging action or eccentric loading upon or against any structure. Ground surface on which backfill is to be placed shall be prepared as specified in paragraph 3.7, Preparation of Ground Surface for Embankments. Compaction requirements for backfill materials shall also conform to the applicable portions of paragraphs 3.7, 3.8 and 3.9, Preparation of Ground Surface for Embankments, Embankments, and Subgrade Preparation. Compaction shall be accomplished by sheeps-foot rollers, pneumatic-tired rollers, steel-wheeled rollers or other approved equipment.

3.6 Trench Excavation and Backfill

See Specification SPC-10-CE-4800-603.

3.7 Preparation of Ground Surface for Embankments

The prepared ground surface shall be scarified to a depth of 6 inches and moistened or aerated just prior to placement of embankment materials to assure adequate bond between embankment material and the prepared ground surface.

3.8 Embankments

All earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with maximum dimensions not greater than 3 inches. The material shall be placed in successive horizontal layers of loose material not more than 12 inches in depth with the top 3 feet of embankment shall be placed in layers of 6 inches in depth. Each layer shall be spread uniformly on a prepared surface, i.e., a soil surface that has been moistened or aerated as necessary and scarified or otherwise broken up in such a manner that the fill will bond with the surface on which it is placed; plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent of maximum density. Compaction requirements for the upper portion of earth embankments forming subgrade for structures, pavements and railroad roadbed shall be identical with those requirements specified in paragraph 3.9, Subgrade Preparation. Compaction shall be accomplished by sheeps-foot rollers, pneumatic-tired rollers, skil-wheeled rollers or other approved equipment.

3.9 Subgrade Preparation

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain proper compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Low areas resulting from removal of unsatisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified. After rolling, the surface of the subgrade for roadways shall not show deviation greater than 0.1 foot when tested with a 10 foot straight-edge applied both parallel and at right angles to the centerline of the area. The elevation of the required subgrade shall not vary more than 0.05 foot from the established grade and approved cross section.

A Compaction shall be accomplished by sheeps-foot rollers, pneumatic-tired rollers, steel-wheeled rollers or other approved equipment.

1. Subgrade for pavements and shoulders shall be compacted to at least 95 percent of maximum density.

2. Subgrade for structures shall be compacted to at least 95 percent of maximum density.

3.10 Finishing

The surface of all excavations, embankments, and subgrades shall be finished to a reasonably smooth and compact surface substantially in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for all graded areas shall be within 1/10 foot of the grades and elevations indicated except that the degree of finish for subgrades shall be as specified in paragraph 3.9, Subgrade Preparation hereinbefore. Gutters and ditches shall be finished in a manner that will result in effective drainage. The surface of areas to be seeded shall be finished to a smoothness suitable for the application of seeding materials.

3.11 Subgrade and Embankment Protection

During construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained in such a manner as to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operations and shall be protected and maintained by the Contractor in a satisfactory condition until concrete, ballast or base is placed. The storage or stockpiling of materials on the finished subgrade shall not be permitted. No concrete, base course, or ballast shall be laid until the subgrade has been checked and approved, and in no case shall concrete, base course, or ballast be placed on a muddy, spongy, or frozen subgrade.

3.12 Testing for Determination of Density

Testing shall be the responsibility of the contractor. The Owner or his Manager shall be afforded reasonable access to perform confirmation testing. Tests will be performed in sufficient number to ensure that the specific density is being obtained. At least one test will be performed for each location or area that fill or backfill is placed and each 500 cubic yard of material placed. At least one test will be performed in each 2 feet or less of compacted material processed as a unit. Moisture-density relations will be determined in accordance with ASTM D-1557, Method D. Field in-place density will be determined in accordance with ASTM D-1556.